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| (21) International Application Number: PCT/NL98/00647 (22) International Filing Date: 9 November 1998 (09.11.98) (30) Priority Data: 1007492 7 November 1997 (07.11.97) NL (71) Applicant (for all designated States except US): MACHINE-FABRIEK COMPAS B.V. [NL/NL]; Van Aalstweg 15, NL-1625 NV Hoom (NL). (72) Inventor; and (75) Inventor/Applicant (for US only): KOSTER, Simon [NL/NL]; Housterweg 46, NL-1607 HE Hem (NL). (74) Agent: BARTELDs, Erik; Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL). | | (81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>In English translation (filed in Dutch).</i> |
| (54) Title: METHOD AND DEVICE FOR ISOLATING PRODUCTS AND WEIGHING AND COUNTING SYSTEM COMBINED THEREWITH | | |
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| (57) Abstract | | |
| <p>The invention relates to a method for isolating agricultural or horticultural products, by transporting the products over a track, the width of which substantially corresponds with that of a single product and catching and returning to the beginning of the conveyor track products which fall from the track. The products are transported uniformly over the track, and the isolated products are lifted from the end of the conveyor track. The invention also relates to a device for carrying out this method provided with one or more conveyor tracks for the products, the width of which substantially corresponds with that of a single product, and means arranged under the conveyor track for catching fallen products and returning them to the beginning of the conveyor track. The mutual distance of the conveyor tracks may be greater than the dimensions of the products. Each conveyor track may comprise an array of roller pairs or diabolos placed in series and may have an adjustable width. The invention further relates to a method for sorting agricultural or horticultural products, comprising isolating the products, lifting the isolated products, weighing each lifted product and, subject to the thus determined weight, releasing each product at a determined location. Finally, the invention provides a system for carrying out this sorting method.</p> | | |

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**METHOD AND DEVICE FOR ISOLATING PRODUCTS AND WEIGHING AND
COUNTING SYSTEM COMBINED THEREWITH**

The invention relates to a method for isolating products, particularly bulbous, tuberous or root-like agricultural or horticultural products. Such a method is already known.

5 The separation of products is important for instance as preparation for sorting thereof, particularly when this sorting takes place using a so-called weighing/counting device. The products are herein weighed one by one and sorted per weight class, wherein a record
10 is simultaneously kept of how many products have been detected in each weight class.

In the known method the products are raised from a collecting container over a sharply inclining compartment conveyor, wherein there is only space in each compartment
15 of the conveyor for a single product. Products lying on top of another product thus roll downward along the conveyor into the collecting container where they are then scooped up again by a following passing compartment of the conveyor. The thus separated products are finally
20 delivered to a weighing/counting device which likewise comprises a compartment conveyor, the compartments of which are each provided with a weighing mechanism.

This known method is not wholly satisfactory, particularly for products which can easily become
25 mutually entangled, such as for instance lily bulbs which have relatively long root hair. In addition, this known isolating method is comparatively time-consuming, while it cannot be used well in combination with modern weighing/counting devices which are equipped with
30 weighing grippers.

The invention therefore has for its object to provide an improved isolating method. This is achieved

according to the invention with a method wherein the products for isolating are transported over a track, the width of which substantially corresponds with that of a single product and products which fall from the track are
5 caught and returned to the beginning of the conveyor track. By making use of a relatively narrow conveyor track from which the products will easily fall, it is not necessary to make use of a steep incline. Transport over a track can thereby still take place relatively rapidly
10 using relatively little power. Due to the narrow track there is moreover little chance of a plurality of products reaching the end of the track together. While this may entail an already separated product sometimes still falling from the track and having to be carried all
15 the way back again, the isolating capacity which can be achieved in this manner is nevertheless found to be greater than is possible with conventional methods.

Owing to the relatively narrow track, a uniform transport of the products over the track can suffice for
20 good operation. It is not therefore necessary to carry out a shaking operation. Separation hereby requires less energy, while there is moreover less danger of damage to the products. The products can however be guided to the conveyor track by an irregularly moving chute. This
25 enables a kind of "pre-"separation to be carried out.

The separated products are advantageously lifted from the end of the conveyor track, for instance by weighing grippers of a modern weighing/counting device. Products which may still be mutually entangled after
30 being lifted from the conveyor track can herein be pulled apart, thus ensuring that only one product at a time is actually delivered to the weighing/counting device.

The products are preferably set into rotation during the transport. In this manner root tendrils which may be
35 present can be wound round the products, whereby the products become manageable.

The invention also relates to a device for performing the above described method. Such an isolating

device is provided according to the invention with at least one conveyor track for the products, the width of which substantially corresponds with that of a single product, and means arranged under the conveyor track for
5 catching fallen products and returning them to the beginning of the conveyor track. The conveyor track can herein be uniformly movable.

In order to enlarge the capacity the isolating device preferably has a number of parallel conveyor
10 tracks, the mutual distance of which is greater than the dimensions of the products. A plurality of rows of products can thus be processed adjacently of each other, wherein an excess of products can drop through between the adjacent conveyor tracks onto the return means. Each
15 conveyor track can herein comprise an array of roller pairs or diabolos placed in series, between which "compartments" are as it were formed in each case for receiving a single product. The width of the or each conveyor track can herein be adjustable, whereby products
20 of different sizes can be separated. For this purpose the rollers of each roller pair can be displaceable transversely of the transporting direction.

Advantageously the device further has means for adjusting the distance between the rollers of each roller pair. A
25 structurally simple embodiment is obtained when the adjusting means comprise a seesaw means on which are arranged adjusting members with inclining engaging surfaces for placing in engagement with the rollers.

In preference the isolating device is further
30 provided with means for supplying products to the or each conveyor track, which supply means comprise at least one vibrating chute. When a plurality of conveyor tracks are used, the number of vibrating chutes corresponds with the number of conveyor tracks. In order to ensure a good
35 "pre-"separation of the products, each vibrating chute is preferably defined by two parallel members rotatable on their longitudinal shaft.

The isolating device is further provided with or co-acts with means for lifting the separated products from the end of the conveyor track in the form of grippers which are at least locally displaceable parallel to the
5 conveyor track. Means are preferably also present for pulling apart products lifted from the conveyor track which are still mutually entangled, for instance in the form of one or more arresting means placed under the path of the grippers.

10 The isolating device preferably has means for setting into rotation the products on the or each conveyor track. In this manner any root tendrils which may be present can be wound round the products, whereby the products can be handled better by the grippers. These
15 product rotation means can comprise a finger belt arranged above the or each conveyor track.

The invention further relates to a method for sorting products, particularly bulbous, tuberous or root-like agricultural or horticultural products, consisting
20 of isolating the products in the manner as described above, lifting the separated products, weighing each lifted product and, subject to the thus determined weight, releasing each product at a determined location. Each weighed product is advantageously counted herein.

25 Finally, the invention also relates to a system for performing this sorting method, formed by an isolating device of the above described type and a device placed in series with the isolating device for weighing each lifted product and releasing each product at a determined
30 location subject to the thus determined weight, wherein the weighing device preferably comprises means for counting each weighed product.

The invention is now elucidated on the basis of two embodiments wherein reference is made to the annexed
35 drawing, in which:

figure 1 shows a partly cut-away perspective view of a first embodiment of the isolating device according to the invention,

figure 2 shows a cross-section of a vibrating chute as seen in the direction of arrow II in figure 1,

figure 3 shows a cross-section of two adjacent conveyor tracks as seen in the direction of arrow III in
5 figure 1,

figure 4 is a perspective view of an alternative embodiment of the isolating device according to the invention,

figures 4a and 4b show a product before and after
10 passing through the positioning unit of the device of figure 4,

figure 5 is a perspective detail view of this positioning unit, and

figure 6 is a perspective detail view of the
15 adjusting mechanism of the device of figure 4.

A device 1 for isolating products 2 (figure 1), in the shown example lily bulbs, is provided with a number of parallel conveyor tracks 3, the width b of which substantially corresponds with that of a single product
20 and the mutual distance d of which is greater than the dimensions of the products. Products 2 are displaced uniformly by conveyor tracks 3 in the direction of arrow T. Under conveyor tracks 3 are arranged means 4 for catching and returning to the beginning of the conveyor
25 track products 2 which have fallen between conveyor tracks 3. These catching and return means 4 are formed by a catching belt 5 which is arranged under conveyor tracks 3 and is displaceable parallel thereto and which extends over the whole width of conveyor tracks 3 and comes out
30 above a cross conveyor 6. Products 2 are eventually carried by this cross conveyor 6 to a return belt (not shown here) which is displaceable parallel but in opposing direction to the transporting direction T, and whereby the fallen products 2 are carried back to the
35 beginning of the isolating device.

In the shown embodiment each conveyor track 3 is formed by an array of roller pairs 7, 7 placed in series.. Each roller 7 herein has a chamfered peripheral edge 8 so

that each pair of rollers 7, 7 together take the form of a diabolo. Instead of rollers 7, 7 a single diabolo could also be applied in each case. Formed in each case between two successive roller pairs is a kind of "compartment" which provides space for a single product 2. As stated, the width b of this compartment is herein practically equal to the width of a single product 2, so that any product which does not lie precisely in a compartment falls from conveyor track 3 (fig. 3). This applies particularly for products lying on top of each other. Because the intermediate space d between conveyor tracks 3 is considerably larger than the dimensions of the products 2, these latter moreover do not remain suspended between two conveyor tracks 3.

15 In order to enhance the isolating operation the roller pairs 7, 7 can also be rotated. Rollers 7 are arranged for this purpose on shafts 9, the outer ends of which are rotatably mounted in a transporting chain 10 which is trained over a number of wheels 11 and is driven by a motor (not shown here). Further present is a drive belt 12 which is trained over a number of pulleys 13 and driven by a separate motor (not shown). This drive belt 12 runs over a part 35 parallel to conveyor track 3 and is in engagement with rollers 14 which are arranged on each shaft 9. By varying the speed and direction of movement of drive belt 12 relative to the speed of transporting chain 10 it is thus possible to achieve that the shafts 9 with rollers 7 thereon stand still over the relevant part of conveyor tracks 3 when drive belt 12 moves just as rapidly as chain 10 or, conversely, that they rotate forward or backward. The intensity of the isolating operation can thus be adjusted.

The products 2 for isolating are supplied to the conveyor tracks by supply means 44 which comprise a number of parallel vibrating chutes 15. The number of vibrating chutes 15 corresponds with the number of conveyor tracks 3. Vibrating chutes 15 are each defined by two parallel cylindrical members 16 rotatable on their

longitudinal shaft 17 which have a tapering end 18. Cylindrical members 16 are rotatably received with their shaft 17 in two bearings 19 which form part of a vibrating frame 20, which is in turn connected movably to main frame 21 of device 1. Further arranged on each shaft 17 is a rope pulley 22 over which a rope 23 is guided which is further trained over a lower rope pulley 24, which is displaced through a quarter-turn. This lower rope pulley 24 is placed on a shaft 25 which is driven over a crank 26 by a motor 27. Crank 26 herein converts the rotation of motor 27 into a reciprocating movement of rope pulley 24 round shaft 25 as according to arrow P. This reciprocating movement is finally transmitted by ropes 23 to the cylindrical bodies 16.

As stated, frame 20 with vibrating chutes 15 is connected movably to the main frame with interposing of rubber blocks 28. Vibrating frame 19, which inclines slightly toward conveyor tracks 3, is set into vibration by two vibration motors 29, only one of which is shown. As a result of the sloping arrangement of vibrating frame 19 a relatively small stroke of the vibrating movement can suffice in combination with a high vibration frequency.

A first isolating step already takes place in supply means 44 due to the combination of the vibrating movement and the reciprocating or rotation movement of the cylindrical members. Undersized products, lumps of earth and other contaminants with dimensions smaller than the intermediate space s between cylindrical members 16 are herein also sieved out. These products and contaminants drop onto a cross conveyor 30 (fig. 2) placed under vibrating chutes 15, whereby they are discharged. Products 2 which fall between the cylindrical members 16 of adjacent vibrating chutes 15 drop at the end of the vibrating chutes into the widened openings defined by the tapering ends 18 of members 16 and also fall through between conveyor tracks 3 onto catching belt 5. Only the products 2 which move in the vibrating chutes defined by

cylindrical members 16 drop at the end of the chutes between the narrowed end parts 18 onto a conveyor track 3 running directly thereunder. Products 2 are thus "pre-separated".

5 Present at the end of conveyor tracks 3 are means 31 for lifting the separated products 2 therefrom. These lifting means 31, which can already form part of a weighing/counting device 32 connecting onto isolating device 1, are formed in the shown embodiment by grippers
10 34 which are displaceable parallel to the latter part 33 of conveyor tracks 3. Grippers 34 are suspended from belts or chains 36 which are trained over wheels or pulleys 37 and are opened and closed by a per se known cam mechanism, which is not further elucidated here. Each
15 gripper 34 can comprise a weighing mechanism. The mutual distance of the successive grippers 34 corresponds with the distance between successive rollers 7 of conveyor tracks 3, while in addition grippers 34 run synchronously with the conveyor tracks.

20 One gripper 34 at a time thus comes out above a "compartment" and moves over some distance parallel thereto. During this movement the gripper 34 is closed whereby a product possibly present in the "compartment" thereunder is grasped. After a short distance the
25 conveyor tracks 3 curve away downward whereby products 2 are therefore transported further by grippers 34. In order to separate products which may still possibly be entangled with each other and which generally hang together with their roots 38, a forked arresting means 39
30 is arranged behind each conveyor track 3 and suspended slightly beneath the path of grippers 34. The mutually entangled roots 38 are caught in this forked arresting means, whereafter the lower of the two products 2 remains suspended behind the fork during continuing movement of
35 gripper 34 and drops onto a cross conveyor 40, whereby it is transferred again to the return belt which returns the product to the beginning of the isolating device 1.

As stated, the products are each weighed and sorted per weight class in the weighing/counting device 32, wherein the number of products in each weight class is also recorded. The limits of the weight class can herein
5 be chosen such that two products which each have the minimum weight are together heavier than the maximum weight. Products which may still possibly be entangled with each other can thus be detected by the weighing/counting device 32 and be removed. These
10 products can then be carried back to the beginning of isolating device 1. A presorting can otherwise already take place by adjusting the width b of conveyor tracks 3 and the width s of vibrating chutes 15. Products of different dimensions can thus be separated in adjacent
15 conveyor tracks 3.

In an alternative embodiment of the isolating device (fig. 4) a positioning unit 57 is placed above the feed side thereof. This positioning unit 57 has a finger belt above each conveyor track 3 which is formed by a belt-
20 like carrier 58 on which a large number of relatively long, flexible fingers 59 are arranged. Belt-like carrier 58 is trained round two reversing rollers 60, 61 which are rotatably mounted on shafts 62, 63 accommodated in a frame 64. One of the shafts, in this case shaft 62,
25 functions as collective drive shaft and is driven by a motor 66 via a drive belt 65.

Positioning unit 57 has the purpose of setting the products 2 on conveyor tracks 3 into rotation, whereby roots 38 are wound therearound (fig. 4b). This is
30 important because roots 38 would otherwise drag behind products 2. Since the length of these roots 38 is greater than the distance between two successive grippers 34 of weighing/counting device 32, there is the danger of roots 38 of a first product 2 being left behind on conveyor
35 track 3 during raising thereof by a first gripper 34 and being grasped by a following gripper 34. This would then result in the product 2 not dropping when released by the first gripper but remaining suspended on the following

gripper 34 with its roots, whereby product 2 is therefore not placed in the correct sorting class and the weighing and counting are thus disrupted. This problem is resolved by winding the roots 38 round products 2. The rotation
5 speed of products 2 is herein determined by the ratio of the turning speed of finger belt 58 and the transporting speed of track 3.

In this embodiment the fixed rollers 7 are otherwise replaced by rollers 47 slidable along shaft 9 (fig. 6).
10 The width b of each conveyor track 3 and the intermediate space d between two adjacent conveyor tracks 3 can hereby be adjusted. For this purpose the rollers 47 each take the form of a "toadstool" and have a disc-like part 41 with rounded edge 42 and a sleeve 43 connected thereto.
15 Rollers 47 are placed pairwise in each case with their disc-like parts 41 adjacent of each other. Arranged in each roller 47 is a bore for shaft 9 with two grooves 45 close to the extremities of the bore, in each of which grooves is arranged an O-ring 46 which fits closely round
20 shaft 9. The roller 47 is held in position on shaft 9 by these O-rings 46.

In order to adjust the distance between two adjacent rollers 47, and therefore the width b of conveyor track 3, a mechanism 48 is arranged on the underside of device
25 1 which engages in the return part of conveyor tracks 3. In the shown embodiment the adjusting mechanism comprises for each conveyor track 3 a T-shaped seesaw means 49 which is pivotable on a horizontal transverse shaft 50. Placed on the ends of each T-shaped seesaw means 49 are
30 three adjusting blocks 51 which are provided with truncated cone-shaped end portions 52. The two adjusting blocks 51 on the "lying" leg of the T-shape are herein placed on either side of a pair of rollers 47, while the adjusting block 51 on the end of the "standing" leg of
35 the T-shape is situated precisely between the two rollers 47. Protruding on the underside of seesaw means 49 is an actuating arm 53 which is pivotally connected by means of a shaft 54 to an outer end of a drive rod 55. The other

outer end 56 of drive rod 55 is connected to a control (not shown). If seesaw means 49 were now to be pivoted by displacing of drive rod 55 such that the side with the two adjusting blocks 51 moves upward, the intermediate
5 space between these adjusting blocks 51 would decrease still further as a result of the cone shape of the top part 52 thereof, whereby rollers 47 of each pair are urged toward each other and the width of conveyor track 3 therefore decreases. If on the other hand seesaw means 49
10 is pivoted to the other side, whereby the single adjusting block 51 between rollers 47 moves upward, these rollers 47 are then urged increasingly further apart by the cone-shaped end part 52 of this adjusting block 51. The width b of each conveyor track 3 can thus be adapted
15 quickly and easily. Drive rods 55 of seesaw means 49 can otherwise be jointly operated if all outer ends 56 are connected by a single shaft, or individually operated.

The method and device according to the invention thus enable separation of products in rapid and reliable
20 manner.

Although the invention is described above with reference to a number of embodiments, it will be apparent to the skilled person that it is not limited thereto. The scope of the invention is therefore defined solely by the
25 appended claims.

CLAIMS

1. Method for isolating products, particularly
bulbous, tuberous or root-like agricultural or
horticultural products, by transporting the products over
a track, the width of which substantially corresponds
5 with that of a single product and catching and returning
to the beginning of the conveyor track products which
fall from the track.

2. Method as claimed in claim 1, **characterized in**
that the products are transported uniformly over the
10 track.

3. Method as claimed in claim 1 or 2, **characterized**
in that the products are guided to the conveyor track by
an irregularly moving chute.

4. Method as claimed in any of the foregoing claims,
15 **characterized in that** the separated products are lifted
from the end of the conveyor track.

5. Method as claimed in claim 4, **characterized in**
that after being lifted from the conveyor track products
which are still mutually entangled are pulled apart.

20 6. Method as claimed in any of the foregoing claims,
characterized in that the products are set into rotation
during the transport.

7. Device for isolating products, particularly
bulbous, tuberous or root-like agricultural or
25 horticultural products, provided with at least one
conveyor track for the products, the width of which
substantially corresponds with that of a single product,
and means arranged under the conveyor track for catching
fallen products and returning them to the beginning of
30 the conveyor track.

8. Isolating device as claimed in claim 7,
characterized in that the conveyor track is uniformly
movable.

9. Isolating device as claimed in claim 7,
characterized by a number of parallel conveyor tracks,
the mutual distance of which is greater than the
dimensions of the products.

5 10. Isolating device as claimed in any of the claims
7-9, characterized in that the or each conveyor track
comprises an array of roller pairs or diabolos placed in
series.

10 11. Isolating device as claimed in any of the claims
7-10, characterized in that the width of the or each
conveyor track is adjustable.

12. Isolating device as claimed in claim 11,
characterized in that the rollers of each roller pair are
displaceable transversely of the transporting direction.

15 13. Isolating device as claimed in claim 12,
characterized by means for adjusting the distance between
the rollers of each roller pair.

14. Isolating device as claimed in claim 13,
characterized in that the adjusting means comprise a
20 seesaw means on which are arranged adjusting members with
inclining engaging surfaces for placing in engagement
with the rollers.

25 15. Isolating device as claimed in any of the claims
7-14, characterized by means for supplying products to
the or each conveyor track, which supply means comprise
at least one vibrating chute.

16. Isolating device as claimed in claim 15,
characterized in that the number of vibrating chutes
corresponds with the number of conveyor tracks.

30 17. Isolating device as claimed in claim 15 or 16,
characterized in that the or each vibrating chute is
defined by two parallel members rotatable on their
longitudinal shaft.

35 18. Isolating device as claimed in any of the claims
7-17, characterized by means for lifting the separated
products from the end of the conveyor track.

19. Isolating device as claimed in claim 18,
characterized in that the lifting means are formed by

grippers which are at least locally displaceable parallel to the conveyor track.

20. Isolating device as claimed in claim 18 or 19, characterized by means for pulling apart products lifted from the conveyor track which are still mutually entangled.

21. Isolating device as claimed in claim 20, characterized in that the pulling means comprise at least one arresting means placed under the path of the grippers.

22. Isolating device as claimed in any of the claims 18-21, characterized by means for setting into rotation the products on the or each conveyor track.

23. Isolating device as claimed in claim 22, characterized in that the product rotation means comprise a finger belt arranged above the or each conveyor track.

24. Method for sorting products, particularly bulbous, tuberous or root-like agricultural or horticultural products, comprising of isolating the products by applying the method as claimed in any of the claims 1-6, lifting the separated products, weighing each lifted product and, subject to the thus determined weight, releasing each product at a determined location.

25. Method as claimed in claim 24, characterized in that each weighed product is counted.

26. System for sorting products, particularly bulbous, tuberous or root-like agricultural or horticultural products, comprising an isolating device as claimed in any of the claims 6-16, and a device placed in series with the isolating device for weighing each lifted product and releasing each product at a determined location subject to the thus determined weight.

27. System as claimed in claim 26, characterized in that the weighing device comprises means for counting each weighed product.

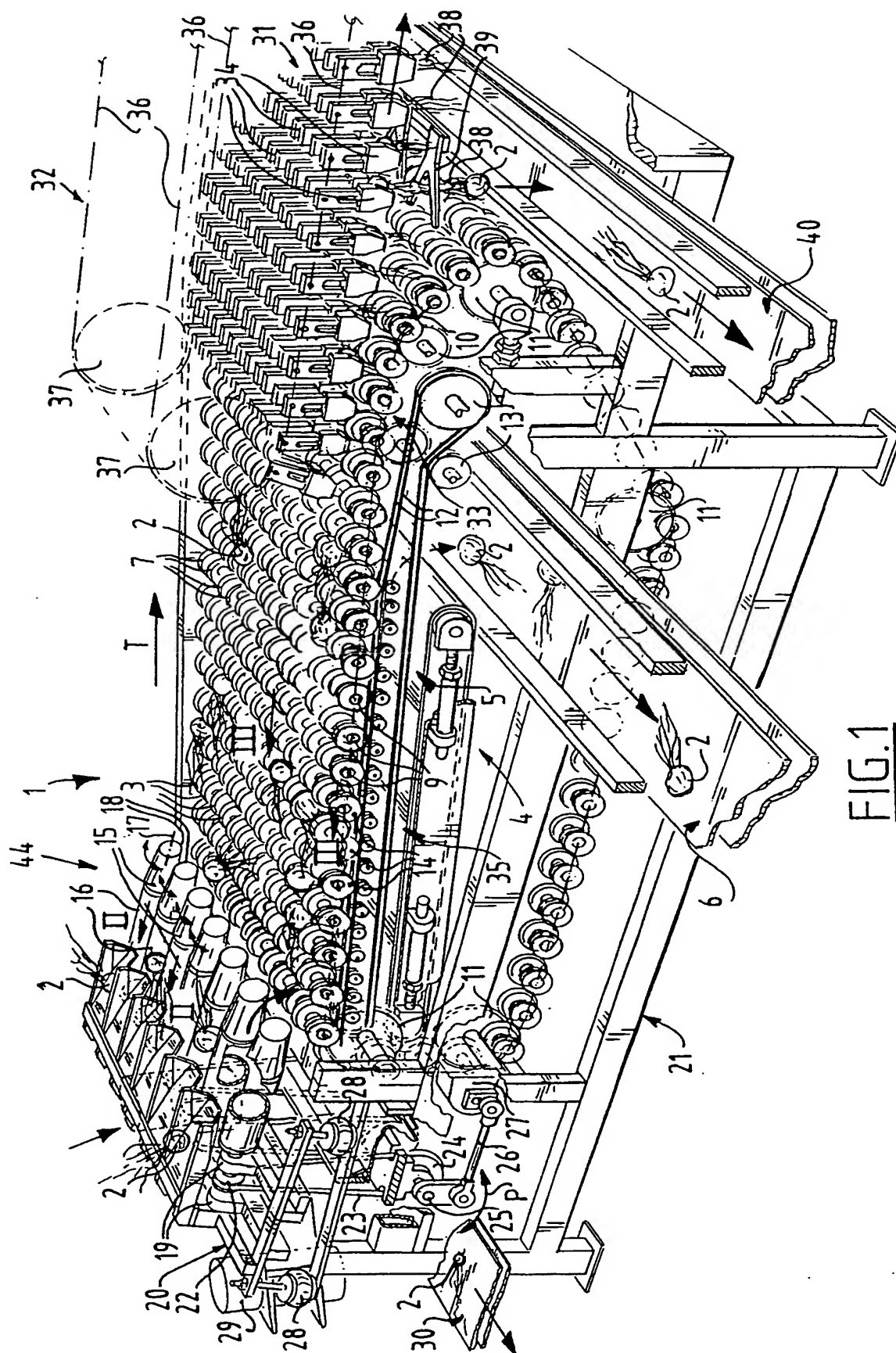


FIG. 1

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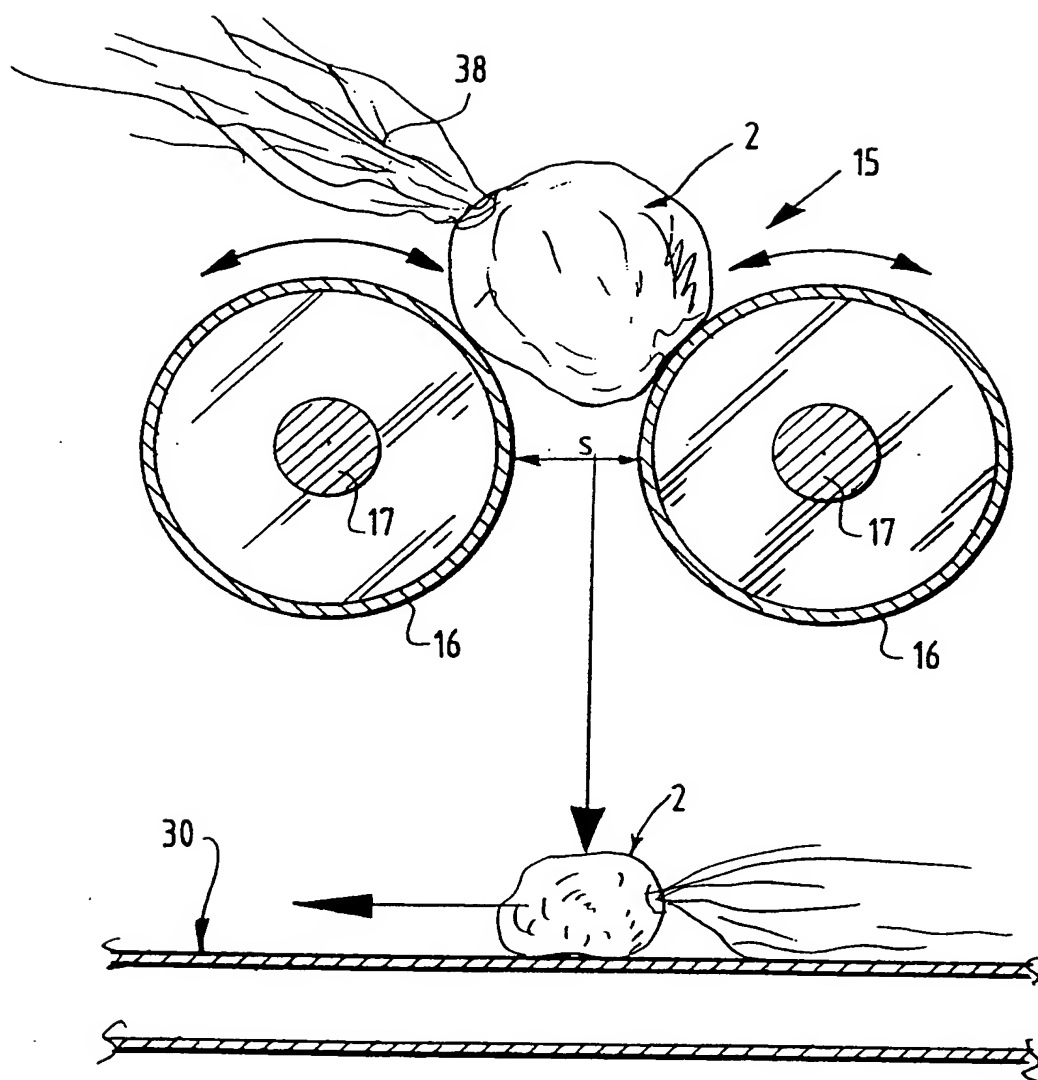
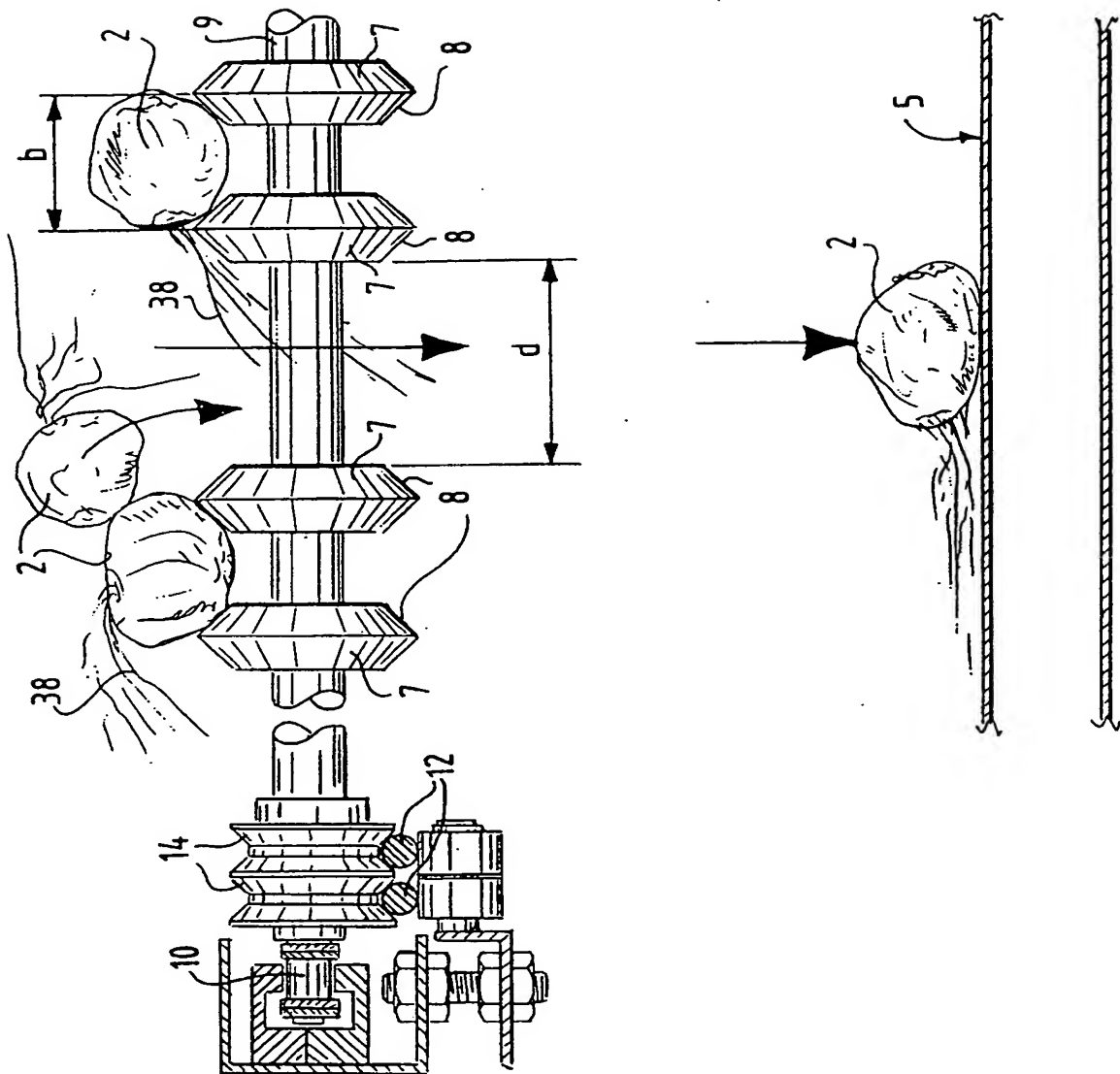
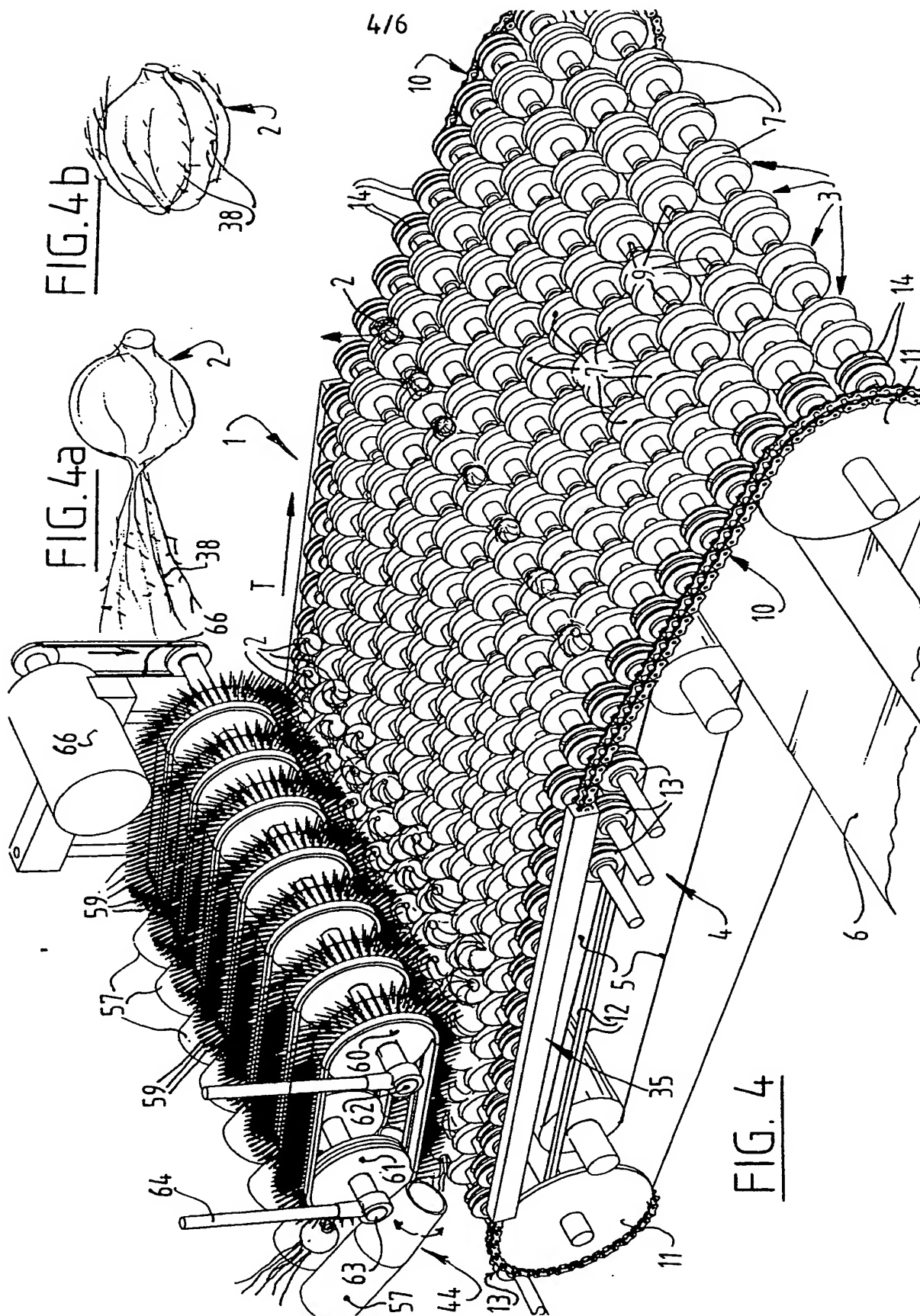
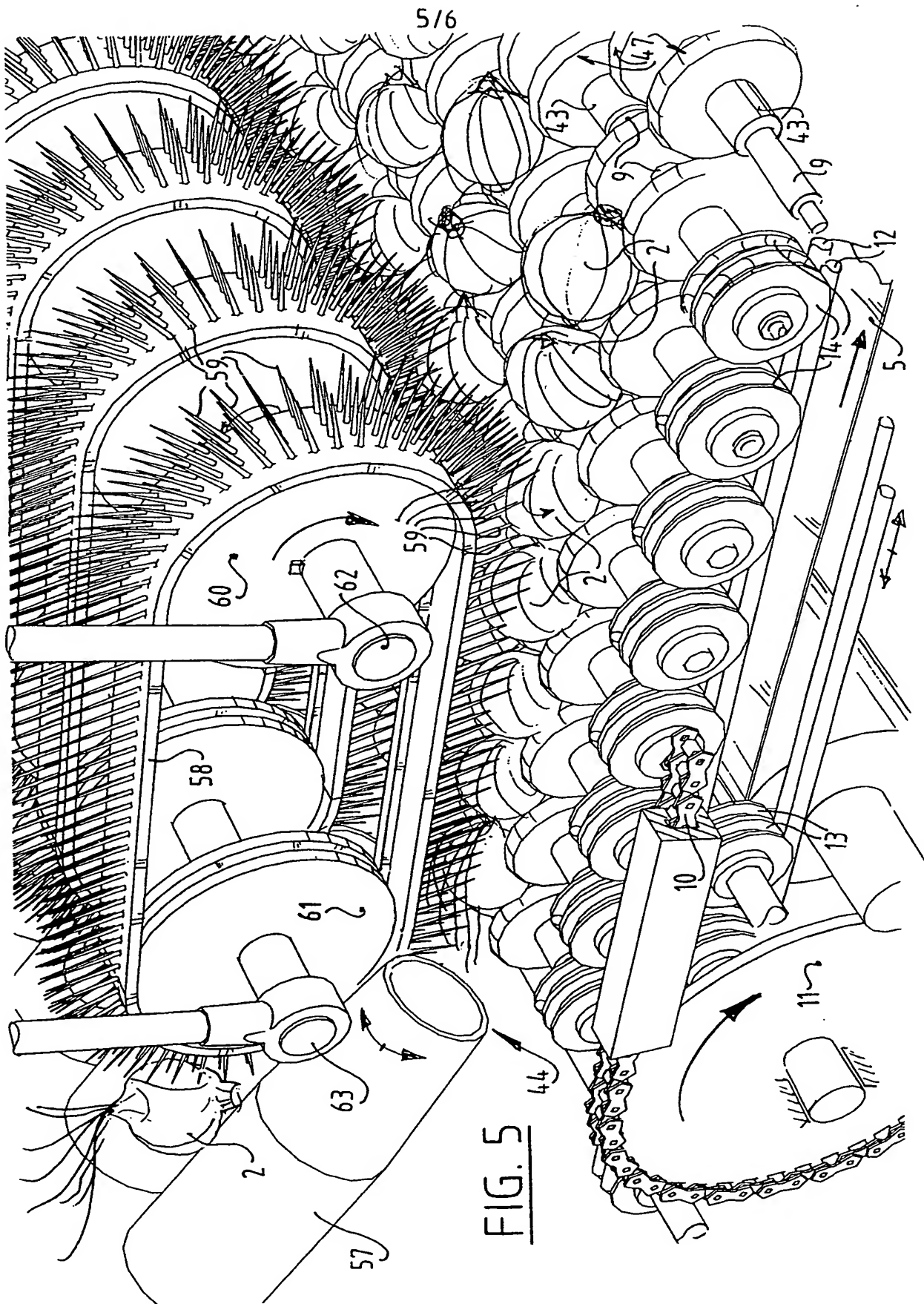
FIG. 2

FIG. 3







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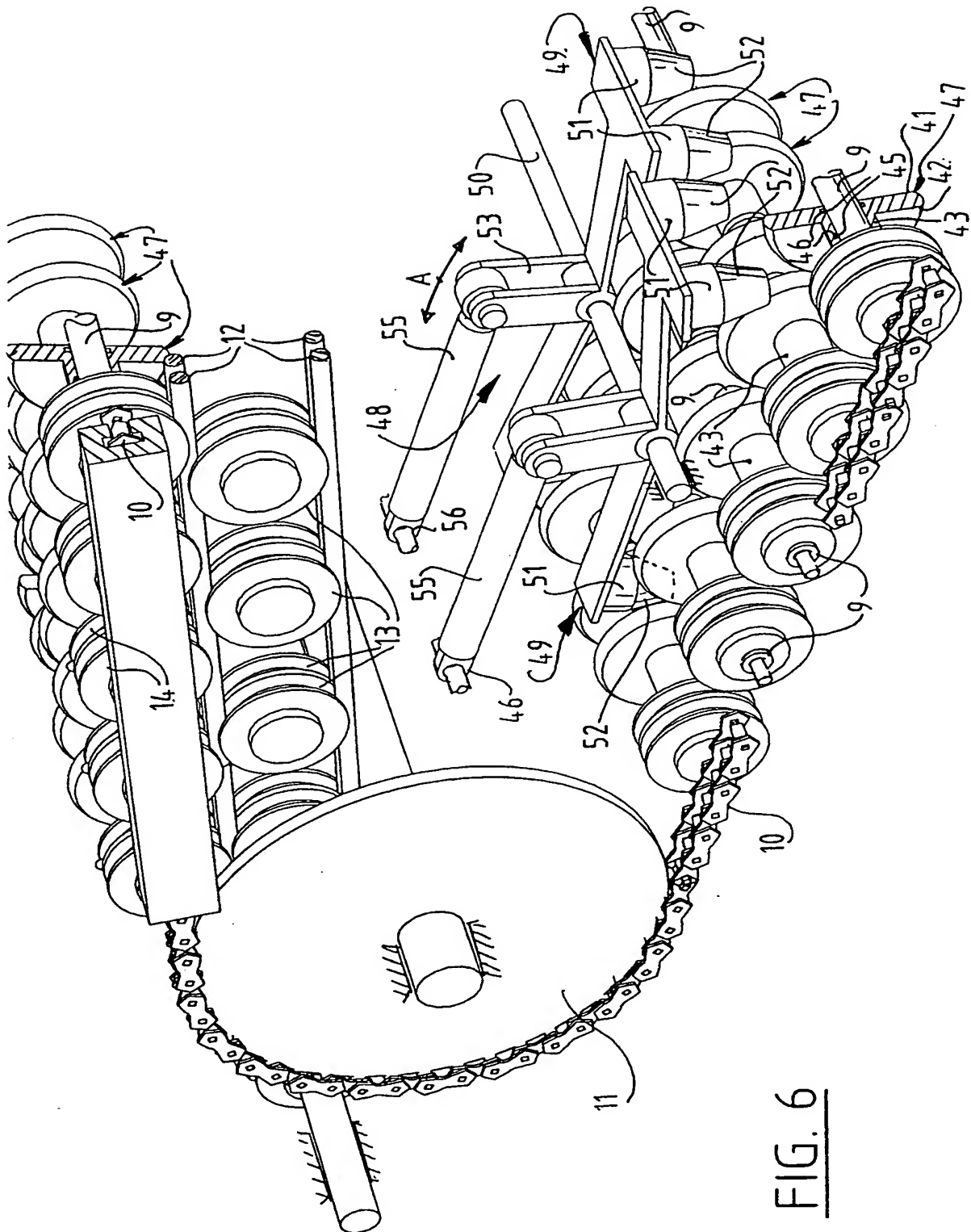


FIG. 6

INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 98/00647

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B65G47/14 B65G47/256

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B65G B07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---|-----------------------|
| X | US 4 047 636 A (LIST HANS) 13 September 1977 see the whole document --- | 1,2,7-9, 15 |
| A | EP 0 454 267 A (TAS ADRIANUS WILHELMUS) 30 October 1991 see the whole document --- | 1,4,6,7, 18,22 |
| A | PATENT ABSTRACTS OF JAPAN vol. 013, no. 140 (M-810), 6 April 1989 & JP 63 306121 A (ISEKI & CO LTD), 14 December 1988 see abstract --- | 1,7,11 |
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| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
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